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ABSTRACT

This study investigated the construct validity of five perceptual traits (auditory discrimination, visual discrimination, visual memory, visual-motor coordination, and auditory to visual-motor coordination) with five simulated work samples (union assembly, resistor reading, budgette assembly, lock assembly, and nail and screw sort) from the Jewish Employment Vocational Service System (JEVS). The subjects (mean age was 14.4 and mean intelligence quotient was 94.0) were 36 learning disabled applicants attending a prevocational assessment program in Monmouth County, New Jersey. Five subtests, from three different tests, were administered to the subjects. The tests included: (1) the Weschler Intelligence Scale for Children-Revised; (2) the Specific Language Disability Test, and (3) the JEVS. The test scores were analyzed by Pearson product-moment correlation. Utilizing the paradigm of convergent-discriminant validity, convergent validity was evidenced in four of the five work samples and discriminant validity was demonstrated in three of the five work samples. The following work samples measured a distinct perceptual construct: (1) union assembly measures visual memory; (2) budgette assembly measures visual discrimination; and (3) lock assembly measures auditory discrimination. The results indicate that simulated work samples can be used as a diagnostic instrument for assessment of perceptual abilities in a vocational setting. (PN)

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CONVERGENT-DISCRIMINANT VALIDITY OF THE JEWISH EMPLOYMENT VOCATIONAL SYSTEM (JEVS)

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ABSTRACT

Convergent-Discriminant Validity

of the Jewish Employment and Vocational System

This study investigated the construct validity of five perceptual traits with five simulated work samples from the Jewish Employment Vocational Service System (JEVS). The subjects, mean CA 14.4, were thirty-six learning disabled applicants who attended a prevocational assessment program. Utilizing the paradigm of convergent-discriminant validity, convergent validity ($p<.01$) was evidenced in four of the five work samples and discriminant validity ($p<.01$) was demonstrated in three of the five work samples. The results indicate that simulated work samples can be used as a diagnostic instrument for assessment of perceptual abilities in a vocational setting.

Convergent-Discriminant Validity of the
Jewish Employment and Vocational Service System

When compared with various indicies of vocational evaluation for the handicapped, the work sample has three main advantages: 1) it assesses the same skills, aptitudes, and abilities as required for specific jobs without relying on academic performance; 2) the samples look like "real work", thus, the appearance tends to motivate the student more than psychometric tests; and 3) work samples are much less affected by educational level and psycholinguistic deficits than other tests (Backman, 1977; Kulman et al, 1975; Neff, 1966; Phelps & McCarty, 1984; Roberts, 1983). Based on a job analysis approach, the work sample attempts to provide information for job screening, identification of the present level of functioning in an occupational task, individualized vocational training, and career awareness (Dunn, Korn, & Andrew, 1976; Stodden, 1980; Waugh, 1982).

Historical Perspective

The concept of the work sample for vocational assessment of mentally handicapped individuals was adapted from the field of rehabilitation. Initially, rehabilitation instituted a medical model of diagnosis and prescription which was carried out by physical therapists, occupational therapists, and rehabilitation nurses. The underlying philosophy of the medical model included

the assumption that the client possesed the mental abilities to complete the task but lacked the physical capability. Thus, the medical team's primary goal was to provide restoration of a physical ability which previously existed.

In addition to medical information, other techniques such as the counselor-client interview, and psychological and aptitude tests, were included in the rehabilitative plan. The work sample was added to the testing process because the job analysis component placed emphasis on the breakdown of a job into sequential steps (Neff, 1977) and the reason for failure can be isolated by the direct observation of the client as he/she is performing the various steps of the job. The data is formulated into a plan for retraining and a recommendation for a potentially successful area of employment (Jewish Employment and Vocational Service, 1970; Rosenberg & Usdane, 1963; Singer Education Division, 1973).

In education, the procedure to establish the vocational direction for the handicapped has taken the same focus as the rehabilitation model. The resulting recommendations are based on direct observation of the student's physical capabilities as he/she is performing the steps on a work sample required for a particular job. Generally, if success is achieved, the option of vocational training is recommended in an occupational area in which the task is performed. If failure is observed, the student is simply transferred to another work sample which measures a different task. If many work samples, which evaluate

specific skills, are attempted and failure still persists, the handicapped individual is usually placed in an unskilled training program or deemed not ready for vocational training.

Problem

Since the evaluation places the same emphasis on the observation of physical capabilities, the use of the work sample as an evaluative measure for the mentally handicapped is not valid because the assessment of mental abilities that contribute to successful performance is not included. Utilizing the present rehabilitation model for the handicapped, the vocational evaluator cannot determine whether failure to perform the job task is due to a mental handicap, or simply, the lack of skill training. Typically, the tasks cannot be restructured or adapted to minimize the effects of a mental handicap on work sample performance.

One exception to the process of adapting the work sample in vocational education is in the assessment of the physically handicapped. The work sample, in this case, has been restructured. For example, a student with visual impairment is provided with a magnifying glass or tools with tactile symbols such as braille. Written directions are given in large print or recited orally.

The determination of the effect of the physical handicap on task performance is straightforward. Simple observation will identify those components of the task which are directly

influenced by the physical impairment. The components of the task can be restructured to minimize the effect of the handicap on skill performance and facilitate an accurate assessment of a student's true ability for vocational skill acquisition.

For the mentally handicapped, there is no adaptation or restructuring of the work sample to minimize the effect of the mental impairment. Therefore, an underlying cause for failure on the work sample is not apparent. Unsuccessful completion of a task could be due to either a simple lack of training and/or the handicapping condition.

In order to formulate an accurate assessment utilizing the work sample approach for the mentally handicapped, equal emphasis must be placed on: 1) the identification of the sequential tasks necessary for job completion; and 2) the mental processes required to perform the task. At present, job analysis is an integral component of the work sample but the mental abilities necessary for the completion of each of the tasks have not been identified.

Mental processes, specifically perceptual abilities, cannot be directly observed, and, therefore, the effect of these abilities on work sample performance is difficult to identify and measure. Means, other than simple observation, must be used. Identification of discrete traits inherent in a test, known as construct validation, is one approach. At present, no research has investigated the perceptual constructs that are inherent in each work sample.

Guiding Questions

Vocational placement and career choice of the mentally handicapped is based on a testing process which has not been validated with mental constructs, such as perception. Therefore, the decision, based on this evaluative procedure is, at best, tenuous. If compliance with P.L. 94-142 (Education of All Handicapped Children Act of 1975) is to be achieved in vocational education, a broader scope than just pure assessment by means of job analysis must be defined.

Consequently, the purpose of this investigation was to determine the construct validation of five work samples from the JEVS (Jewish Employment Vocational Services) System. Utilizing the paradigm of convergent-discriminant validity with the multitrait-multimethod matrix, the following guiding questions were addressed:

1. Is there a relationship between the performance on work samples and tests which measure perceptual traits?
2. Is there evidence of construct validity in five work samples from the JEVS System with five perceptual traits?

METHOD

Subjects

Subjects were thirty-six handicapped students chosen by random sampling from 163 learning disabled applicants who attended the Prevocational Assessment Program at Monmouth County

Vocational School District, Career Center. Students who were multiply handicapped were not included in the study. Smith et al (1984) suggested a set of guidelines to be used for subject descriptions of research with the learning disabled to facilitate replication of the study. Table 1 describes the subjects used in the research.

Design

Campbell and Fiske (1959) have formulated a systematic approach for investigating construct validity. This approach is known as convergent-discriminant validity which organizes the correlations between the variables in the form of a multitrait-multimethod matrix.

Convergent validity is demonstrated if independent measures of the same trait correlate higher than measures of different traits involving separate methods. Discriminant validity is evidenced if a test does not correlate with other tests which measure different traits.

The selected constructs were five perceptual traits: auditory discrimination, visual discrimination, visual memory, visual-motor coordination, and auditory to visual-motor coordination. Two methods of measurement, the Weschler Intelligence Test for Children (Weschler, 1974) and the Specific Language Disabilities Test (Malcomesius, 1967), which measure specific perceptual traits, were used as criterion measures for construct validity of the Jewish Employment and Vocational

Table 1

Description of Learning Disabled Students Used in the Study

Numbers:		IQ:	
male	30	mean	94.0
female	6	range	89-123
total	36	test	WISC-R
Age:		Specific Achievement:	
mean	14.4	area	Math
range	13-15	mean	5.01
		range	2.3-8.1
		test	WRAT
Race:			
White	28	area	Reading
Black	5	mean	4.6
Other	3	range	2.1-7.6
		test	WRAT
SES:			
high	2		
middle	31		
low	3		

Services (Jewish Employment and Vocational Services, Inc., 1973).

Data Collection Procedures

Five subtests, from three different tests, were administered to the subjects. The first set of five subtests from the Weschler Intelligence Scale for Children-Revised (WISC-R) was administered by a school psychologist who was involved in the re-evaluation process for classification. The scaled scores were used in the analysis.

The following subtests from the WISC-R were utilized:

1) Information
2) Picture Completion
3) Picture Arrangement
4) Block Design
5) Digit Span

Five subtests from the Specific Language Disability Test (SLDT) were administered during the Prevocational Assessment Program to the subjects. A simple scoring method, which counts the total number of correct items on each subtest, was used. Each item was scored either correct or entirely incorrect so that one error was counted per item. The protocol in the test booklet was used to compile the subtest results for the subject.

The following subtests were given from the SLDT:

1) Test II
2) Test III
3) Test IV

4) Test VI

5) Test VII

Five work samples from the Jewish Employment and Vocational System (JEVS) were administered by Two Prevocational assessors during the assessment program at the Career Center. A simple scoring method which counted the total number of steps that were performed adequately was used. Therefore, each step was either correct or entirely incorrect so that one error was counted per step. The five work samples used in the study were:

1) Union Assembly

2) Resistor Reading

3) Budgette Assembly

4) Lock Assembly

5) Nail and Screw Sort

Statistical Procedures and Data Analysis

The test scores were analyzed by the Pearson product-moment correlation (r) which determines the relationship between two sets of variables, in this case, the test scores.

The correlations were set up in a multitrait-multimethod matrix formulated by Campbell and Fisk (1959) who have formulated a systematic approach for investigating construct validity. This approach is known as convergent-discriminant validity which organizes the correlations between the variables in the form of a multitrait-multimethod matrix. Table 2 is an illustration of this matrix with the data results from the study. In order to

Table 2
Multitrait-Multimethod Matrix

	METHOD 1 SLDT					METHOD 2 JEVS					METHOD 3 WISC-R				
	A_1	B_1	C_1	D_1	E_1	A_2	B_2	C_2	D_2	E_2	A_3	B_3	C_3	D_3	E_3
A_1	(75)														
B_1	-53	(85)													
C_1	-40	83	(78)												
D_1	-22	17	-01	(53)											
E_1	24	08	03	-08	(84)										
A_2	38	-10	02	-12	19	(96)									
B_2	-27	43	37	10	07	-15	(88)								
C_2	14	19	43	-21	20	-04	12	(94)							
D_2	-02	-12	-06	33	-15	11	20	-25	(71)						
E_2	-30	35	23	16	01	-15	38	12	20	(52)					
A_3	19	28	25	06	37	33	24	28	-09	24	(88)				
B_3	01	02	-03	-13	24	06	17	23	-04	16	22	(72)			
C_3	14	06	29	-35	02	20	15	41	-04	15	36	-04	(74)		
D_3	06	08	12	33	02	26	23	03	40	23	-06	21	06	(84)	
E_3	-01	29	39	10	44	04	38	18	13	38	18	26	47	02	(79)

facilitate the analysis of the data, various regions of the matrix are labeled.

The reliabilities (in parentheses) constitute the reliability diagonal. Split-half reliabilities were reported for all subtests. The solid-line triangles represent the correlations for one method and two traits (heterotrait-monomethod values). For instance, A_1E_1 (r=.24) a correlation in the solid triangle at the top of the matrix measures one method, (1) with two traits, A and E. The reliabilities (in parentheses) and the adjacent heterotrait-monomethod triangle (solid line) constitute the monomethod block.

The heterotrait-heteromethod block is made up of a validity diagonal and two broken line triangles. These correlations represent one trait correlated with two methods of measurement (heterotrait-heteromethod values). For instance, A_1A_2 (r=.38) the first correlation in the validity diagonal, correlates Trait A with Methods 1 and 2. A heteromethod block is made up of a validity diagonal and two heterotrait-heteromethod triangles lying on each side of the diagonal. The total configuration resembles three broken line rectangles.

The matrix (Table 2) represents all of the intercorrelations of the five perceptual traits as measured by each of the fifteen subtests. The correlations examined the extent to which test scores are related with measures of the same behavior (convergent validity), and the extent to which test scores do not relate with

measures of different behavior (discriminant validity). Fisher's r-Zr transformations permitted averaging of coefficients and allowed convergent and discriminant validity comparisons. McNemar's (1962) t-test for comparisons of coefficients without common subscripts was used to test significant differences between the averaged convergent-discriminant validities.

Results

Campbell and Fiske (1959) purport that three assumptions must be fulfilled before convergent-discriminant validity is evident:

Convergent Validity

Convergent validity is evidenced if a test correlates highly with the variables with which it should theoretically correlate. One assumption is attributed to convergent validity.

Assumption I. Evidence of convergent validity is indicated if the correlation in the validity diagonal is significantly higher than zero. Table 3 illustrates the results of the averaged correlations between a work sample and a subtest which measures the same construct. Four of the work samples showed evidence of convergent validity: Union Assembly, Resistor Reading, Budgette Assembly, and Lock Assembly. Nail and Screw Sort did not show evidence of convergent validity, that is, Nail and Screw Sort did not show evidence of measuring the perceptual construct, auditory to visual-motor coordination when correlated with other subtests that measure auditory to visual-motor

Table 3

Comparisons of Averaged Convergent and Discriminant Coefficients

Work Sample	Convergent Validity (Monotrait-Heteromethod) Assumption I	Discriminant Validity (Heterotrait-Heteromethod) Assumption II	t	(Heterotrait-Monomethod) Assumption III	t
A_2	.372*	.058	2.55*	.042	2.62*
B_2	.316*	.171	1.17	.174	1.16
C_2	.448*	.132	2.57*	.143	2.53*
D_2	.383*	.019	2.96*	.036	2.89*
E_2	.205	.146	.48	.165	.41

*Significance at the .01 level

coordination.

Discriminant Validity

Discriminant validity is evidenced if a test does not correlate with other tests which measure different traits. In this study, two assumptions underlie discriminant validity: 1) a subtest from one test should not correlate with a subtest from another test that measures a different trait (Assumption II); and 2) a subtest should not correlate with another subtest that measures a different trait within the same test (Assumption III).

Assumption II. In this study, evidence of discriminant validity (Assumption II) is indicated if the average convergent coefficient is significantly ($p<.01$) greater than the average heterotrait-heteromethod correlation. Table 3 illustrates the results of the t-tests for Assumption II. Three work samples, Union Assembly, Budgette Assembly, and Lock Assembly showed evidence of meeting the criteria for Assumption II. Two work samples, Resistor Reading and Nail and Screw Sort, did not meet the criteria for Assumption II, therefore, they did not show evidence of discriminant validity because both work samples correlated with a subtest that purports to measure a different trait.

Assumption III. In this study, compliance with Assumption III is indicated if the average convergent coefficient is significantly ($p<.01$) greater than the average heterotrait-monomethod correlation. Table 3 illustrates the results of the t-tests for Assumption III. Three work samples,

Union Assembly, Budgette Assembly, and Lock Assembly met the criteria for Assumption III. Two work samples, Resistor Reading and Nail and Screw Sort did not meet the criteria for Assumption III.

Conclusions

In this study, construct validity, defined by Campbell and Fiske (1959) as requiring evidence of both convergent and discriminant validity, was demonstrated in three of the five work samples used in the study. The following work samples measure a distinct perceptual construct:

1) Union Assembly measures visual memory
2) Budgette Assembly measures visual discrimination
3) Lock Assembly measures auditory discrimination

Resistor Reading showed evidence of convergent validity and can be used to as an evaluative measure to test visual-motor coordination. However, Resistor Reading did not show evidence of discriminant validity. Nail and Screw Sort did not show evidence of convergent or discriminant validity. Therefore, Nail and Screw Sort does not measure auditory to visual-motor coordination as a discrete perceptual trait.

Discussion

Simulated work samples, such as the Jewish Employment Vocational System (JEVS), are currently being used to assess a handicapped individual's level of skill ability in vocational education. Simulated work samples, in general, are based on a

task analysis structure which places emphasis on the observation of physical capabilities. The use of the work sample as an evaluative measure for the mentally handicapped is not valid because the inclusion of mental abilities that affect the performance of the work sample is not represented.

This study indicates that specific perceptual constructs, utilizing the approach purported by Campbell and Fiske (1959), are inherent in the work sample. With this added component, the work sample can be used as an evaluative procedure for the handicapped.

Knowledge of the construct being tested by the work sample broadens the interpretative and instructional value when assessing handicapped by facilitating: 1) the adaptation of the work sample to minimize the handicapping condition of the student; 2) utilization of instructional techniques that enhance successful performance; 3) promotion of an accurate assessment of a student's true ability in a vocational skill; and 4) identification of specific educational strategies that are tailored to meet the needs of the handicapped individual in the vocational setting.

Application to Prevocational Assessment

For instance, the work sample, Lock Assembly, showed evidence of measuring auditory discrimination as a discrete perceptual trait. If a student demonstrates a deficit in auditory discrimination based on prior testing, the evaluator can

restructure or adapt the work sample to minimize the effect of the deficit on performance of the work sample by: 1) repeating the instructions; 2) asking the student to paraphrase the instructions to verify comprehension; or 3) administering the directions in written form. If successful performance is achieved as a result of the restructuring of the work sample, the adaptation can be noted on the assessment report and communicated to the vocational teacher. The vocational teacher can then institute this clinical teaching method when oral instructions are given and the student is experiencing difficulty with the vocational task.

The proposed assessment process for evaluation of handicapped individuals in a vocational setting now places equal emphasis on the identification of sequential tasks necessary for job completion and the mental processes required to perform the tasks. The additional component of the identification of the mental constructs inherent in the work sample gives an added dimension of investigating the underlying reason for performance on the work sample and facilitates the use of adaptive teaching strategies to promote mastery of vocational skills in a shop setting for the handicapped individual.

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